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CREDIBILITY, RENT-SEEKING AND POLITICAL INSTABILITY

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Summary

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This paper describes conditions under which state institutions reduce political instability. The institutions examined are all those that restrict the ability of any single state decision maker to act unilaterally. They might include an effective legislature and an independent judiciary (checks and balances), as well as federalism, elections and a professional, high-quality bureaucracy. These institutions make it costly for an individual decision maker to renege on promises that she has made to her followers, once those promises are embodied in law. In the absence of such institutions, the credibility of a decision maker's promises to followers must rely on informal enforcement mechanisms, such as repeated exchange or kinship ties. This characteristic of institutions is found to enhance political stability. However, it also promotes secure property rights, suggesting that the relationship between political stability and economic performance may have roots in a country's political and legal institutions.

Instability and institutions are analyzed in the context of a game between two leaders, one of whom is in power and the other of whom is out of power. Each makes promises to those followers with whom she can make credible agreements, in order to positively affect her probability of repelling or succeeding in an overthrow attempt. Appropriate institutions lower the costs of ensuring credibility, and therefore are likely to expand the number of potential followers. Consequently, the effect of institutions on the leader in power is modelled as a change in the number of followers with whom the leader can make credible commitments. In the most plausible cases, an increase in the credibility of the leader in power reduces the probability that the leader out of power will attempt a revolt, and raises the probability that the leader in power will not resign her office. That is, an increase in the credibility of the leader in power reduces instability.

This intuitive result provides an explanation for several empirical regularities, including the "coup trap" (Londregan and Poole, 1990), the relatively high level of political stability observed in Africa (see Alesina, et al., 1991), and the relationship between political instability and economic success. Where political stability is ensured by institutions, these same institutions act to restrain state decision makers from violating property rights. Where the credibility of agreements between leaders and followers is established by extra-institutional mechanisms, as in Africa, no such protection for property rights exists, and stability co-exists with poverty.

Credibility, Rent-seeking and Political Instability

Philip Keefer

Introduction

Despite growing evidence that political instability stifles economic growth, attempts to develop a theory of regime instability have enjoyed only mixed success in providing systematic explanations of its causes.[1] This is not surprising; regime change has many antecedents, ranging from economic outcomes of various kinds to ideology and institutional structure. These are not easy to integrate, quantify, or model. This article introduces to the debate over the roots of political instability a concentrated focus on two contributing factors. One of these has been widely considered: how do opposing leaders distribute the benefits of government between themselves and their supporters? A second source has received less attention: the credibility of the leaders who promise to distribute these benefits.

The introduction of credibility of state officials into the analysis of instability has two effects. First, because political and legal institutions are a principal means by which state officials can establish their credibility, the argument forges a link between political instability and institutions. Second, because a lack of state credibility hinders economic activity, the introduction of credibility suggests a common cause for both political instability and economic stagnation. Few would dispute the notion that unstable or unpredictable policies discourage entrepreneurs; this is one of the explanations offered for the detrimental effect of regime instability on growth. However, according to the argument developed below, regime, or political, instability is only the manifestation, and not the cause, of lack of credibility. When credibility is absent, both economic growth and political stability suffer.

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[1] See, for example, Alesina, et. al. (1991) and Barro (1991).

The decision of government and opposition leaders regarding the extent to which they share the rents (or potential rents) of office with supporters is a source of strategic interaction between them. This interaction forms the core of this paper. Opposing leaders struggle to maintain sufficient support to attain their political objectives; at the same time, they attempt to maximize the share of the rents of office that they can dedicate to their own consumption. The premise that drives the paper is that leaders find it worthwhile to share rents only with those supporters with whom credible agreements can be made. Consequently, when the number of people with whom one leader can make credible agreements changes, both leaders modify the benefits that they assign to themselves, each taking into account the reactions of the other. Given appropriate assumptions, the argument developed below concludes that an increase in the credibility of the leader in power enhances political stability.[2]

Credibility and Political Support

Credibility is a crucial ingredient in political conflict. Individuals typically support leaders because they expect that leaders will reward the support that they provide today with benefits in the future. Leaders depend, consequently, on the credibility of their promises concerning those benefits in order to attract political support. This is certainly true of leaders in opposition who, because they are out of power, cannot immediately distribute the benefits of governing. In contrast, leaders in power enjoy a greater scope for providing supporters with rewards concurrently with their demonstrations of support. This might seem to mitigate their need to establish a basis for

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[2] Sufficiently brutal repression seems also to produce stability, but its effectiveness may reduce the credibility of the government (or, conversely, a government may find it difficult to preserve its level of credibility if it embarks on a highly repressive course of action). To the extent that this is true, the model abstracts away from an interesting problem. If this interactive effect is not important, however, there is no other reason to believe that the predicted effects of changes in leader credibility should change if repression is integrated into the analysis. While the ruthless exercise of repression by a leader surely contributes to the ability to hold on to power, it does not obviate the need for credible agreements with supporters, even if those supporters are only the 1,000 secret policemen who conduct the repression.

credible agreements. However, for several reasons, their ability to stay in power is amplified if they can also extract support in the present in exchange for promises of future benefits.

The ability to use both present and future rewards to pay for current support loosens the leader's budget constraint in the present. The incumbent leader's need for support is likely to vary substantially over time and, in particular, to vary more than the incumbent's ability to distribute rents to supporters. The capacity to make promises regarding future distributions of rent allows the incumbent to respond better to an acute need for political support at any given moment. In addition, the leader who is restricted to simultaneous agreements confronts the problem that not all forms of support can be verified at the time that they are provided. For example, the commitment to persuade others to support the leader can only be verified by observing the persuasion, which is costly, or by evaluating the extra support that emanates from the group targeted for persuasion, which of necessity occurs after the service has been provided to the leader, removing the exchange from the realm of simultaneity. Under these circumstances, simultaneous contracting is not possible. The possibility of future payment, then, increases the feasibility of those agreements in which the quantity or quality of current actions can only be measured in the future. These arguments suggest that a government with a limited capacity to make credible commitments has fewer means at its disposal to attract support.

In the absence of some mechanism that ensures credibility, supporters are not likely to be sanguine about a leader's compliance with his promises. The chief preoccupation of potential supporters is that rewards promised to them might evaporate when the leader decides to dispose of the resources at his command in a way other than what he promised. Anything from avarice to the leader's unanticipated need for support among new groups might be more than sufficient temptation for the leader to renege.

There are many ways to establish credibility, a large fraction of which have been the subject of substantial research. For example, the repeated game literature has thoroughly analyzed the role of reputation and repeated dealings as mechanisms for establishing self-enforcing agreements.[3] Other literature has identified different bases for self-enforcing agreements, including kinship, ethnic, religious, caste and friendship ties, particularly in the context of commercial and financial transactions in developing countries.[4]

A state's institutions also make an important difference in the credibility of leaders, and it is worthwhile to underline the point that institutions vary substantially from country to country. States in which it is difficult for a leader to change decisions, once they are made, permit the promises of that leader to be more credible than those of a leader who can freely alter previous decisions. Institutions that might control the tendency of leaders to alter previous decisions include an independent judiciary, a powerful legislature, elections, and certain institutions of federalism.[5] These institutions allow individuals, who otherwise would have no basis in kinship or friendship ties for making credible agreements with the leaders in power, to receive credible commitments from these leaders.

Ironically, institutions make leaders more credible in part by making it more costly for some individuals to achieve credible agreements. Those are the individuals who, in the absence of institutions, can make self-enforcing agreements at low cost with the leader. The presumption, however, is that the number of such individuals is small and that their gains from dealing with the non-credible state are minor in relation to the

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[3] See, for example, Kreps and Wilson (1982), Milgrom and Roberts (1982) and Axelrod (1984).

[4] One example of this large literature is Landa (1981).

[5] The effect of these institutions is hardly unknown. James Madison recognized two hundred years ago that institutions such as these were necessary to control excessive or arbitrary state actions. For contemporary analyses of Madison's intuition, see Grofman and Wittman (1989).

gains that the remainder of the population can achieve under the umbrella of an adequate institutional framework.[6]

Existing Theories of Instability

The literature on political instability is large, and explores a variety of causal factors, ranging from economic inequality and growth to the fractionalization of political parties. The effects of political instability on economic growth are also the subject of a substantial literature. Some research makes the direct argument that political instability restricts economic growth (as in Alesina (1991) and Barro (1991)). Another branch of the literature identifies links between political instability and growth-restricting economic policies. It is generally argued in this latter literature that government instability compels incumbents to myopic, and therefore less than optimal, policy decisions. Ozler and Tabellini (1991), for example, find evidence that political instability increases the size of sovereign loans to which countries subscribe.[7] They reach the intuitive conclusion that leaders with short horizons attempt to maximize the rents at their disposal. The issue of credibility that underlies the argument below provides an explanation both for political instability, and for the differing limits on the lengths to which leaders can go to obtain those rents. Grossman (1991) is interested in discovering optimal redistributive policies for governments that face the possibility of insurrection with a given probability of success. He finds that when the probability of a successful insurrection increases, government policies are more redistributive and economic growth declines.

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[6] This is more likely to be true the greater the number of people in a jurisdiction and the wider its geographic expanse. Both of these factors render it less likely that any particular economic agent can form the necessary interpersonal ties with any particular government official in the absence of institutions, and therefore reduce the number of individuals who can thrive under a deficient institutional system.

[7] For other papers describing the detrimental effects of instability on economic policies, see Tabellini and Alesina (1990) and Alesina and Tabellini (1989).

The argument elaborated below is complementary to these analyses. First, the lack of credibility is identified as a factor that would encourage the political instability that is the starting point for the analysis by Ozler and Tabellini, and Grossman. Second, it suggests that a lack of credibility would make incumbents more likely to engage in myopic behavior, since they could receive no rewards in terms of political support for more beneficial policies that took into consideration long run benefits. That is, the relationship between political instability and short-sighted policies masks a more fundamental relationship between state credibility and those policies.

The literature on the causes of political instability has pursued a more elusive goal; results have been mixed on most hypothesized causal factors, both at the theoretical and empirical levels. In most of this literature, the credibility of promises to supporters is not explicitly examined. Londregan and Poole (1990) find that income levels and growth are inversely related to coups. They also note the existence of a coup trap; countries that have experienced coups are more likely to suffer recurrences, and leaders who gained power through coups are more likely to lose power in the same way. Alesina, et al. (1991) confirm the existence of a coup trap but find little evidence that low rates of economic growth increase the likelihood of government changes (their definition of political instability).[8]

The finding that prior instability increases the probability of future instability might imply, as Londregan and Poole suggest, a "coup trap," in which a trap is a "bad" and stable equilibrium. The analysis below, however, suggests that instability is more likely when government officials lack the institutional mechanisms to credibly commit

[8] Alesina, et al. (1991), and other empirical work in this area, attempt to control for whether countries are democratic or not. They find that their index of democracy is not significant in regressions that test various hypotheses regarding the relationship between political instability and economic growth. The formal trappings of democracy, however, may be neither necessary nor sufficient conditions for the existence of controls on the free exercise of arbitrary authority by the state. One good indicator of this is found among Latin American democracies, many of which have spent the late 1980's and early 1990's implementing important and far-reaching economic reforms through presidential decrees, largely bypassing legislative institutions.

themselves. Since the regimes following successful coups are not, in practice, any more likely to establish these mechanisms than the prior regimes that fell, it is not surprising that one coup leads to another.

Economic inequality has also been the focus of great attention as a cause of political instability. Lichbach (1989) reviews much of the political science literature and finds the results to be mixed, both at the theoretical and empirical levels. Bienen and Gersovitz (1986) explore several cases where developing country governments cut consumer subsidies and find that these cuts often do not lead to civil unrest and instability. Some of the reasons that they identify for the lack of unrest in several countries are instructive and consistent with an emphasis on credibility: a disorganized opposition, which would have difficulty making credible promises to supporters; a unified ruling party and bureaucracy, which would have fewer difficulties; and a well-informed public, which could more easily determine if a government's promises were consistent with its capacity to fulfill them.

Other work, which attempts to more directly model the choice of incumbents and rebel leaders, analyzes the determinants of revolution taking into account variables such as competing demands for policy outcomes (of which rents would be a subset), the probability of success, and the difficulties of forging a cohesive insurgent force. DeNardo (1985) uses a spatial model to examine the strategic choices of incumbents and revolutionary groups, providing a rational basis, for example, for peaceful or violent protest. He takes as given, however, the credibility of the leaders of the respective groups, and also assumes that incumbent and revolutionary make strategic decisions without anticipating the reaction of the other party to those decisions.

Campos (1991) has examined a world of rent-seeking in which elites can only make an agreement not to revolt, in exchange for a share of the rents, with a self-enforcing agreement based on repeated exchange. Exchanges in Campos' model are not between leaders and followers, as in the analysis below, but between opposition leaders

and incumbents. He finds conditions under which perpetual instability would arise. One equilibrium strategy that emerges from his analysis is that incumbents hold all of the rents for themselves and opponents always attempt to overthrow incumbents. If, as is true in many countries, elites choose to retain most or all of the benefits from rent-seeking, Campos argues that the best response of the opposition would be always to attempt to depose them.

The equilibrium that Campos describes is not unique, and the model does not provide an explanation of why this particular equilibrium outcome prevails over others. In the analysis below, the lack of credibility explains why benefits might be distributed narrowly, as in Campos' case. The paucity of potential supporters with whom a leader might make a credible agreement would render the extensive distribution of rents counterproductive for the leader--while giving up rents, he receives no credible support in return.[9] In the model set up by Campos, the narrow distribution of benefits is only one of many possible equilibria; when credibility is absent, his possible equilibrium becomes a more likely one.

Assumptions of The Model

If the lack of credibility pushes leaders inexorably to a narrow distribution of benefits and from there to perpetual instability, the question then becomes, "Under what conditions does increased credibility lead to increased stability?" This question cannot be answered before understanding how leaders decide on the distribution of rents between themselves and supporters.

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[9]Of course, one might observe leaders who share the rents of office more widely, in an attempt to begin a series of long-term exchanges with potential supporters. Repeated exchanges, however, do not necessarily solve the problem of credibility. In the beginning of such a long-term relationship, the leader may encounter unfavorable equilibria, which often exist, in which potential supporters renege. It would not be surprising, either, if leaders made mistakes, and overestimated potential supporters' evaluation of a leader's expected tenure in office. In this case, potential supporters would not be deterred from reneging by the prospect of losing future exchanges with the leader.

In the analysis below, the credibility of a leader increases when the number of people with whom the leader can make credible agreements, (whether because of institutions or interpersonal relationships) rises. Consequently, the model does not distinguish explicitly between countries with strong and weak institutions; the institutional argument rests on the assumption that it is difficult for personal relationships to form the basis of credible agreements with many people. When institutions are in place, it is assumed, more people find it possible to reach credible agreements with leaders.

The analysis of the decisions of the two leaders focuses on the probability that an overthrow attempt will succeed. The probability depends directly on the level of support that each leader enjoys. support is drawn from those individuals with whom a leader can make credible agreements. Potential support is realized when the leaders credibly promise benefits to some or all of the members of the group with which they can make credible agreements, in exchange for political support.

The focus of the model is on the interaction between the two leaders as they react to changes in the number of people with whom the incumbent leader can make credible agreements. Several assumptions are made to tighten this focus. First, the relationship between leaders and supporters is not endogenized. The process by which they bargain over and enforce their agreement is not modelled; rather, the enforceability of the agreements is assumed, whether it be rooted in institutions or in reputation. What varies is the number of individuals in the country over whom this assumption is said to apply. The literature discussed above, however, assumes that no constraint is created by the credibility of leaders. Second, it is assumed that the number of people with whom a leader can make credible agreements determines the upper limit of a leader's political

support; no allowance is made for the possibility that the leader can make investments to expand this group.[10]

Also exogenous in the model are the total rents available to be redistributed by incumbents. Although incumbents can be expected to affect not only the share of rents that they take, but also, because of the policies that they follow, the total rents available for redistribution, for purposes of determining the effects of credibility on stability it is necessary only to focus on the distribution of shares between leaders and supporters. Finally, only the rents that leaders provide specifically to supporters, rather than the benefits or costs that their policies represent for citizens generally, enter into the determination of their political support. That is, rents enter the model, but concepts such as national income do not. Underlying this assumption is one other, that public goods (such as higher national income) are difficult to use as compensation for collective action. The political support that leaders require to stay in or to take power is expensive for individuals to provide; the quantity of public goods that could replace the individual (private) rewards necessary to attract the support of these individuals would be enormous--approximately the amount of the private compensation divided by the probability that their contribution to any collective endeavor would be crucial to that endeavor's success.

There are two political groupings in the model. Leader 1, the leader of Group 1, is in power, while Leader 2 is in the opposition. Leader 2 has the option of starting a revolt or not. The probability that a revolt will succeed, $\rho(l_1, l_2)$, depends positively on the level of political support, l_2, enjoyed by Leader 2 and negatively on the level of

[10] In Keefer (1992), where the costs of rent-seeking are evaluated in the absence of credibility, this assumption is relaxed.

political support, l_1, enjoyed by the leader in power (Leader 1).[11] Support depends, first, on the fraction of the population with which the respective leader can make credible agreements and, second, on the benefits that leaders provide, or promise to provide, to political supporters. That is:

$$l_i = l_i((1 - g_i)R_i, k_i), \quad i = 1, 2,$$

where g_i is the fraction of total rents that the leader retains for herself, R_i is the value of the rents that Leader i distributes between herself and her supporters, and k_i is the fraction of the population with which the leader of Group i can make credible agreements.[12] It is assumed that leaders can only derive political support from individuals with whom they can make credible agreements. The fraction k_i is positively related to the level of political support. As k_i grows, holding constant the share of rents allocated to supporters, support is greater because of a hypothesized "snowball effect." The more potential supporters there are, the more willing individuals will be to offer support for any given reward. Leaders who are perceived as unlikely to attract broad support are forced to offer greater compensation to supporters than are leaders for whom k_i is large, in order to obtain the same amount of support. An additional reason for the effect of k_i is that the presence of more potential supporters leads to greater "competition" for the right to receive rents in exchange for support. This again allows the leader to obtain the same amount of support with a lower expenditure of rents.

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[11] The variable l_i represents some combination of both the number of political supporters and the intensity of their support. Therefore, the terminology is employed that the "level" of political support determines the probability of successful revolt.

[12] This support function abstracts away from the notion that the value to potential supporters of the rent shares that they are offered depends on the probability that the leader offering them will be in office to make delivery. That is, ideally the model would portray support and the probability of a successful revolt as being jointly determined. Incorporating this modification would severely complicate the analysis, and is not likely to substantially change the insights gained. In particular, as explained below, it is likely to drive the conclusions of the model further towards the most plausible of the three cases that are outlined.

The signs of the derivatives of these various functions are found in Table One, where the variable $D_i = (1 - g_i)R_i$. Most cross-derivatives, which are not likely to be significant in any case, have been assumed to equal zero. However, $\frac{\delta^2 l_1}{\delta D_1 \, \delta k_1}$ has a more material effect, and requires a more lengthy explanation of its positive sign. The first reason to assume that this term is positive is that there are likely to be diminishing returns to political support from providing any individual with a share of the leader's rents. If these shares can be spread over more individuals, this diminishing returns effect will be lower at every level of rent-sharing, everywhere raising the marginal productivity of sharing rents. That is, when the number of individuals with which the leader can make credible agreements increases, the marginal productivity of any additional rents that he shares with followers also rises.

The second reason is an extension of the first. It is unlikely that all individuals in the society are equally valuable as potential supporters. Some are richer, more energetic, better connected, ideologically more compatible, and so on. The individuals who can offer the most valuable support need not coincide exactly with those with whom the leader can make credible agreements. The leader would most like to target the resources at her disposal to the most valuable individuals. At high levels of credibility, when the leader has both more potential supporters and more valuable supporters, more resources can be targeted on the valuable supporters before diminishing returns force the marginal product of additional distributions below the marginal product of distributions to less valuable potential supporters. Each of the two reasons supports the assumption that as the level of credibility increases, at every level of distributed rents, the marginal productivity (in terms of political support) of raising rent shares is higher.

The Game that Leaders Play

The two leaders engage in a straightforward series of moves. Leader 1, in power, decides whether to resign or to remain in power. Simultaneously, Leader 2 decides

Table One: Signs of Derivatives of l_i and ρ

$\rho_{l_1} < 0$	by construction; the probability of a successful revolt decreases as support for the incumbent increases.
$\rho_{l_2} > 0$	by construction; as support for the opposition leader increases, so also does the probability of a successful revolt.
$\rho_{l_1 l_1} > 0$ and $\rho_{l_2 l_2} < 0$	by the concavity of ρ; there are diminishing returns to increased levels of political support.
$\frac{\delta l_i}{\delta D_i} > 0$	by construction; support increases as the resources diverted to supporters increase.
$\frac{\delta l_i}{\delta k_i} > 0$	by construction; support increases as the number of people with whom leaders can make credible agreements rises.
$\frac{\delta^2 l_i}{\delta D_i^2} < 0$	by the concavity of l; the distribution of rents to supporters has diminishing returns to political support.
$\frac{\delta^2 l_1}{\delta D_1 \, \delta k_1} > 0$	by assumption; see text for explanation.
$\rho_{l_i l_j} = 0$	by assumption; the marginal impact on the probability of revolt of changes in the support for each leader is independent of changes in support for the other leader.

whether to revolt or not. If Leader 1 remains and Leader 2 revolts, Leader 1 receives $(1 - \rho)(g_1R_1 + \pi_1)$ and Leader 2 receives $(\rho)(g_2R_2 + \pi_2)$. If Leader 1 remains and Leader 2 does not revolt, Leader 1 receives simply $(g_1R_1 + \pi_1)$, and Leader 2 receives π_2. Finally if Leader 1 resigns, she receives π_1, payoffs that are always available to her unless she loses a conflict and Leader 2 earns $(g_2R_2 + \pi_2)$, whether or not she revolts.

- Figure One here-

For tractability in the analysis, the assumption is made that the leaders pursue only pure strategies.[13] In this case, Leader 1's dominant strategy is to remain in power whenever

$$(1 - \rho)(g_1R_1 + \pi_1) > \pi_1 \quad \text{or} \quad (\rho)(g_2R_2 + \pi_2) < \pi_2$$

and to resign otherwise. Leader 2's dominant strategy is to revolt whenever

$$(\rho)(g_2R_2 + \pi_2) > \pi_2$$

and not to revolt otherwise. The problem of revolt aside, both leaders would prefer to be in power. Leader One best improves her chances of remaining in power when she chooses g_1 to maximize $(1 - \rho)(g_1R_1 + \pi_1)$, and Leader Two most improves her chances of attaining power by maximizing $(\rho)(g_2R_2 + \pi_2)$ with respect to g_2.

Each leader's choice of g_i affects the decision of the other, since the levels of political support that each is attempting to influence, l_1 and l_2, appear in both maximands (in ρ). The equilibrium g_i's constitute a Nash equilibrium; they are the g_i's for which neither leader can gain by changing her own share of rents given the share of rents

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[13] If mixed strategies were allowed, Leader 2 would confront the following expected payoff: $\alpha[\beta\rho(g_2R_2 + \pi_2) + (1 - \beta)\pi_2] + (1 - \alpha)(g_2R_2 + \pi_2)$. Leader 1 chooses that value of α, his mixed strategy, that solves the first order condition of Leader 2's expected payoff function (maximizing with respect to β). Since, if Leader 1 gives up power, Leader 2 is always indifferent between revolting and not revolting, and is otherwise never indifferent, the only value of α consistent with the first order condition is $\alpha = 0$; Leader 1 always abdicates. Similarly, for Leader 2 chooses the β that fulfills the first order condition from the maximization of Leader 1's expected payoffs,
$\beta[\alpha(1 - \rho)(g_1R_1 + \pi_1) + (1 - \alpha)\pi_1] + (1 - b)[a(g_1R_1 + \pi_1) + (1 - \alpha)\pi_1]$,
with respect to α. Leader 2 chooses to revolt with a probability of $(g_1R_1) / \rho(g_1R_1 + \pi_1)$, which is valid for $\rho > (g_1R_1) / (g_1R_1 + \pi_1)$. The mixed strategy equilibrium, then, is $\{0, (g_1R_1) / \rho(g_1R_1 + \pi_1)\}$. The non-linear nature of β complicates the subsequent analysis so, since the basic conclusions of the paper are unlikely to be affected by their inclusion, mixed strategies are omitted.

retained by the other leader. The actual decision to revolt then depends on whether the expected revenue from such an attempt, given the strategies of the opposing sides, is less than the expected revenue from not revolting.

Maximizing the first order conditions of each leader i produces $g_i(k_i, R_i, \pi_i, g_j^*)$. By substituting this function into the first order condition of Leader j's problem, the solution for Leader j's problem is obtained, $g_j^*(k_j, R_j, \pi_j, k_i, R_i, \pi_i)$. The question can then be asked, how does the extent of the leader's credibility, given by the fraction of the population, k, with whom she can make credible agreements, affect the conditions that give rise to revolt?

The first order condition for Leader 1's maximization problem is

$$(1 - \rho) = -\rho_{l_1}(g_1R_1 + \pi_1)\frac{\delta l_1}{\delta D_1},$$

and for Leader 2,

$$\rho = \rho_{l_2}(g_2R_2 + \pi_2)\frac{\delta l_2}{\delta D_2},$$

recalling that $D_i = (1 - g_i)R_i$ and that the probability of a successful revolt, ρ, is increasing in the support of Leader 2, l_2, and declining in the support of Leader 1, l_1.

The response of the two leaders to an increase in the number of people with whom the leader in power (Leader 1) can make credible agreements can be found by differentiating the first order conditions with respect to k_1; each of the two resulting expressions contains the terms $\frac{\delta g_1^*}{\delta k_1}$ and $\frac{\delta g_2^*}{\delta k_1}$, creating a system of two equations in two unknowns.

A change in k_1 encourages both Leaders 1 and 2 to modify their decisions regarding g_1 and g_2, respectively. These modifications affect their levels of support, through the functions l_1 and l_2, and, in turn, influence the probability of a successful revolt. In addition, however, a change in k_1 directly affects Leader 1's support for the reasons given above (it is easier for the leader to find supporters, and more likely that she

will obtain support from those whose support is most valuable). By modifying g_i in response to the change in k_1, the leaders balance two competing demands. On the one hand, their own income varies proportionately to g_i. On the other hand, their probability of receiving that income varies inversely with g_i, since a higher g_i reduces the rents available for the supporters of Leader i. In addition, each leader takes into account the fact that her reaction will itself be the subject of a response by the other leader.

The interaction of the two leaders when the credibility of Leader 1 changes is summarized in Proposition One. There are several cases, depending, first, on the magnitude of the cross-derivative, $\frac{\delta^2 l_1}{\delta D_1 \, \delta k_1}$. In Case 1 of Proposition One, this indirect effect of credibility on support is so (even implausibly) large that it outweighs the direct effect of credibility on support. As a consequence, Leader 1 actually reduces her share of rents, since to increase them would mean incurring indirect losses of support that would outweigh the gains in support from the increased credibility. The cases depend, in addition, on the relative magnitudes of $\frac{\delta l_1}{\delta D_1} R_1$ and $\frac{\delta l_1}{\delta k_1}$. The first of these terms indicates the marginal change in political support that the incumbent leader incurs when she changes the distribution of rents between herself and her supporters. The second is the direct effect of credibility on support. If the incumbent leader chooses to react to an increase in credibility by retaining more rents for herself, reducing her support by an amount $\frac{\delta l_1}{\delta D_1} R_1$, then her overall support declines unless the extra support she received directly from the increase in credibility, $\frac{\delta l_1}{\delta k_1}$, is sufficient to compensate. If her overall support declines, which is implausible, then Leader 2 can respond by actually increasing her own share of the rents in response to an increase in Leader 1's credibility (as in Case 3 of Proposition One).

Proposition One

Assuming that the number of individuals with whom Leader 1 can make credible agreements is a reliable index of the credibility of Leader 1, the Nash equilibrium responses of Leaders 1 and 2 to changes in the credibility of Leader 1 (changes in k_1) are given by the following:

Case 1:

If $\left|\frac{\delta^2 l_1}{\delta D_1 \, \delta k_1} \rho_{l_1}(g_1 R_1 + \pi_1)\right| > \left|\rho_{l_1}\frac{\delta l_1}{\delta k_1} - \rho_{l_1 l_1}\frac{\delta l_1}{\delta k_1}\frac{\delta l_1}{\delta D_1}(g_1 R_1 + \pi_1) - \frac{C}{B}\rho_{l_1}\frac{\delta l_1}{\delta k_1}\right|$ then,

$\frac{\delta g_1^*}{\delta k_1} < 0$, Leader 1 decreases her share of rents when her credibility increases;

$\frac{\delta g_2^*}{\delta k_1} < 0$, Leader 2 decreases her share of rents when the credibility of Leader 1 increases.

Case 2:

If $\left|\frac{\delta^2 l_1}{\delta D_1 \, \delta k_1} \rho_{l_1}(g_1 R_1 + \pi_1)\right| < \left|\rho_{l_1}\frac{\delta l_1}{\delta k_1} - \rho_{l_1 l_1}\frac{\delta l_1}{\delta k_1}\frac{\delta l_1}{\delta D_1}(g_1 R_1 + \pi_1) - \frac{C}{B}\rho_{l_1}\frac{\delta l_1}{\delta k_1}\right|$ and

$\frac{\delta l_1}{\delta D_1} R_1 < \frac{\delta l_1}{\delta k_1}$, then

$\frac{\delta g_1^*}{\delta k_1} > 0$, Leader 1 increases her share of rents when her credibility increases;

$\frac{\delta g_2^*}{\delta k_1} < 0$, Leader 2 decreases her share of rents when the credibility of Leader 1 increases.

Case 3:

If $\left|\frac{\delta^2 l_1}{\delta D_1 \, \delta k_1} \rho_{l_1}(g_1 R_1 + \pi_1)\right| < \left|\rho_{l_1}\frac{\delta l_1}{\delta k_1} - \rho_{l_1 l_1}\frac{\delta l_1}{\delta k_1}\frac{\delta l_1}{\delta D_1}(g_1 R_1 + \pi_1) - \frac{C}{B}\rho_{l_1}\frac{\delta l_1}{\delta k_1}\right|$ and

$\frac{\delta l_1}{\delta D_1} R_1 > \frac{\delta l_1}{\delta k_1}$, then

$\frac{\delta g_1^*}{\delta k_1} > 0$, Leader 1 increases her share of rents when her credibility increases;

$\frac{\delta g_2^*}{\delta k_1} > 0$, Leader 2 increases her share of rents when the credibility of Leader 1 increases.

Proof

See Appendix.

The actions of the leaders that are implied by these cases can be summarized in the following way. Leader 1 always takes advantage of increased credibility to augment the share of resources that she retains for herself, except when the increase in k leads to an improbably large increase in the marginal productivity of supplying rent shares to supporters, as in Case 1. Leader 2, attempting to sustain the probability that a revolt attempt by her would succeed, decreases her rental share and increases the shares offered to her supporters when Leader 1 becomes more credible, except in the circumstances described by Case 3. In that case, Leader 1 increases her share of rents in response to her increased credibility, which is plausible, but that increase, on the margin, costs her more support than she gains from the increase in credibility, which is less plausible. Leader 2, in this case, is in a position to increase her share of rents while still able to improve, or at least not worsen, her possibilities of successfully revolting.

This discussion suggests that the conditions surrounding Case 2 are the most reasonable. The direct effects of Leader 1's increase in credibility outweigh the indirect effects, so that Leader 1's support actually increases after she has made adjustments in rental shares to her supporters. Leader 2 attempts to maintain her support relative to Leader 1's, and so reduces her share of rents.

Political Instability and Credibility

Given the response of the leaders to the change in the incumbent's credibility, predictions can be made about the impact of credibility on the probability of revolt and conflict. Two steps are followed to determine this impact. The first is to observe the effect of leaders' decisions on the probability that a revolt will succeed. The second is to evaluate the effect of the change in this probability and the change in the share of rents that each leader retains on the decision to remain in power or to resign, in the case of Leader 1, or to revolt or not, in the case of Leader 2. Proposition Two indicates how the probability of a successful revolt changes when the credibility of Leader 1 increases.

Proposition Two

In all cases, the probability that a revolt will be successful declines when the credibility of the incumbent, Leader One, increases. That is, $\frac{\delta \rho}{\delta k_1} < 0$.

Proof

See Appendix.

This is an intuitive result. The less that potential supporters feel that they can rely on the promises of leaders, the less they will be inclined to openly manifest their support, or in any other way assume costs on a leader's behalf. However, an increase in the probability of a successful revolt is not the same as an increase in instability, which depends on the decisions of the leaders to remain in power or not, or to revolt or not. Proposition Three demonstrates, however, that the likelihood of revolt generally moves inversely with the credibility of Leader 1.

Proposition Three

Define an unambiguous increase in political stability as a decline in the likelihood that Leader 2 will revolt and that Leader 1 will resign. When the two leaders follow pure

strategies, the effects of changes in the credibility of the leader in power (Leader 1) on political stability in the three cases are the following:

Case 1: An increase in credibility unambiguously reduces the likelihood that Leader 2 will revolt; the effect on Leader 1 is ambiguous.

Case 2: An increase in credibility unambiguously reduces the likelihood that Leader 2 will revolt and increases the likelihood that the incumbent, Leader 1, will remain in office.

Case 3: An increase in credibility has an ambiguous effect on the likelihood that Leader 2 will revolt, and unambiguously reduces the likelihood that Leader 1 will resign.

Proof

See Appendix.

The intuitively satisfying assumptions are those surrounding Case Two; in this case political instability unambiguously declines as a result of an increase in credibility. The fundamental reason is that revolt is no longer as attractive to Leader 2, since both her probability of success and her own share of the proceeds from revolting have declined, while remaining in power is more attractive to Leader 1.[14]

In Case One, this indirect effect is larger, and the incumbent actually reduces her share of the rents in response to an increase in credibility. That is, the gains to support from decreasing her rents outweigh the gains to her support from the increase in credibility. In most reasonable cases, this reaction would not lead the incumbent to

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[14] The predominance of Case 2 would likely be reinforced if the probability of a successful revolt and support for a leader were jointly determined (see footnote 12). Whenever $\frac{\delta\rho}{\delta k_1} < 0$ an increase in the credibility of Leader 1 makes it more likely that the conditions of Case 2 will prevail--that Leader 1 will increase her share of the rents, and Leader 2 will decrease her share, because the increase in k_1 raises the expected value of the rent shares to supporters, reinforcing the ability of the incumbent to retain a greater share of the rents, and further limiting the ability of Leader 2 to do the same.

surrender rent shares to the point that her expected income from remaining in office would actually decline. To the extent that this is so, Case One predicts that an increase in credibility generates greater stability. However, if the incumbent reduces her rent share to the point that her expected income from remaining in office declines, a counter-intuitive possibility that cannot be rejected, then she would be more likely to leave office. Regardless of Leader 1's actions, however, under the conditions of Case One Leader Two is more reluctant to revolt when the credibility of the incumbent increases.

The assumption under Case Three that $\frac{\delta l_1}{\delta k_1} < \frac{\delta l_1}{\delta D_1} R_1$ is also unintuitive, since it says that after an increase in credibility the incumbent will enjoy less support than before the increase. Given this circumstance, because Leader 1 increases her share of rents, Leader 2 can also increase her share of rents and not reduce the probability that a revolt by her would be successful. This creates the possibility that Leader 2 is more likely to revolt after an increase in the credibility of Leader 1. Regardless of Leader 2's actions, under the circumstances of Case Three, Leader 1 is more reluctant to leave office.

While many definitions, both operational and theoretical, of political instability exist, most include as at least one element the frequency of leadership turnover. All three cases provide reason to believe that when the incumbent's credibility increases, the likelihood of political turnover decreases, a finding that is reached unambiguously in Case Two. This provides support for the conclusion that political stability increases when the institutions that grant state officials credibility are more firmly entrenched.

Rent-seeking and the Model

An implicit assumption affecting the character of the argument above concerns the nature of rent-seeking. In the model, the level of credibility and of political opposition are independent of the level of rent-seeking in which the incumbent government engages. The importance of this assumption from the character of rents,

which generally involve a transfer from one party to another. If those transfers are financed by individuals with whom no leader can make credible agreements (and who are not, therefore, potential supporters), then it is not a problem to assume that credibility is unrelated to the level of rent-seeking. The abuse of the agricultural sector in developing countries, usually explained by the lack of political representation of agricultural interests and the unique problems of agricultural interests in acting collectively, may also be due to the greater costs that political leaders must incur in making credible agreements with those groups. However, once a leader begins to look for rents within the ranks of either his own or his opponent's potential supporters, the situation changes.

If the government takes rents from current supporters, it essentially reneges on agreements with them, losing credibility in the process. If it takes rents from potential, and not actual, supporters, it sacrifices the opportunity to make future agreements with those potential supporters to elicit their support (assuming that the price of such support would be relief from the outflow of rents that they are forced to endure). Finally, if the government promises rents that come from the supporters or potential supporters of the opposition leader, then it is reasonable to assume that the government's action might increase the possibility of rebellion. In this last situation, the benefits from not revolting would decline. This can be made clear by rewriting the rebellion criterion as $(\rho)(g_2^* R_2 + \pi_2) > \pi_2 - R_1$, an expression that assumes that all of the rents taken by Leader 1 come from the profits of Leader 2.

Relaxing this assumption adds to the intricacy of the problem, but would have the promise of introducing more subtle and realistic interactions that the present analysis overlooks. One prediction that might arise from an enriched model, for example, is that where the pool of individuals who can make credible agreements with all leaders is low, it is easier for greater rents to be extracted without incurring greater risks of overthrow. Nevertheless, the assumption that rent-seeking is exogenous and independent of these

difficulties is not likely to change the basic conclusions drawn from the model regarding the effects of credibility on regime instability.

Illustrations and Conclusion

Instability has been found in rich countries and in poor, in countries with significant and insignificant levels of economic inequality, in countries with apparently high levels of rent-seeking and in countries with low levels. The model presented above looks at the basic building block of a leader's success, the ability to gather political support. Critical to this ability is the credibility of the leader. Holding aside an incumbent leader's capacity for making self-enforcing agreements with supporters, the incumbent's credibility is determined by the nature of the political and legal institutions through which he makes decisions. This is an observation that has received little attention, particularly in research into political instability.[15] Where checks and balances, or a transparent decision making process (in combination with a competitive electoral process), or an independent judiciary prevail, the promises of state officials to their supporters are, once these promises have been made official (as laws or decrees), difficult to reverse.

The literature has produced a number of empirical observations regarding instability. One is the "coup trap;" countries that have experienced coups in the past are more likely to do so in the future.[16] This model generates such a prediction. One would expect more instability in countries (rich or poor, with disparate or egalitarian income distribution) in which upstart dictators have taken power, since they have neither the institutions nor the extensive personal relationships that would allow them to make credible commitments to supporters. Exceptions can arise to this pattern, however. If

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[15] For an examination of the importance of institutions for credibility, see North and Weingast (1989), Cukierman, Webb and Neypati (1991), Keefer (1991, 1992).

[16] See Londregan and Poole (1990).

such leaders have a monopoly on force, and exercise the monopoly with sufficient ruthlessness, they can undermine the ability of the opposition to organize (in particular, they can undermine the opposition's ability to make credible agreements with potential supporters by casting suspicion on personal relationships through the extensive use of secret police, or by prohibiting political gatherings through which credibility might be built).

The model also provides a very preliminary explanation of another observation made in the literature, that African countries exhibit relatively high levels of political stability.[17] These countries present conditions that favor the monopolization of force by incumbents. In general, the absolute number of members in the armed forces is low in Africa relative to other countries (although the size of the military relative to GNP or population may be high compared with other countries).[18] Consequently, "upstart" dictators in Africa may find it easier to make the self-enforcing agreements necessary to maintain the support of the entire military, and therefore to preserve a monopoly on force.

Their monopoly, however, is untempered by any controls on their capacity to make arbitrary decisions with respect to citizens outside of the military; consequently, as far as entrepreneurs are concerned, the promises of the government continue to be largely non-credible, and they manage their investments and economic activities accordingly.

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[17] This is noted by Alesina, et al. (1991). For example, Ghana, Madagascar, Kenya, Zaire, Senegal and Liberia experienced a change of government, on average, .21 times per year from 1972-1981. Panama, Colombia, Argentina and Ecuador averaged .31 times per year over the same period. (Data on frequencies actually comes from Ozler and Tabellini (1991), Table 2). They attribute their observation to the underreporting of regime change in Africa; while underreporting of news is sure to be a large problem, it does not seem likely that notice of regime changes would suffer from this tendency as much as other kinds of news.

[18] See, for example, UNDP (1991), Table 19. According to this, the average number of military in the four Latin American countries in footnote 10 was 38,800 while, in the six African countries, it was 18,616. Only illustrative conclusions can be drawn, since these figures are for a later period than the data on instability.

That is, the non-institutional solution to the leader's political support problem does very little to encourage economic activity, leading to a coincidence of poverty and stability.

States dominated by strong single parties, (defined as parties that have mechanisms to prevent reneging by members, including government leaders), should also be expected to be stable. As in the case of self-enforcing agreements with the military, however, the party institutions are of small comfort to entrepreneurs who seek to protect themselves from arbitrary decisions by the government. The only exception to this is if the interests of the entrepreneurs coincide with those of party members.

Thailand provides an interesting contrast to these examples. On the one hand, it exhibits weak institutions (which present, nevertheless, almost certainly more of a constraint on decision makers than those of African countries). On the other hand, it has an extremely large military, which would be difficult for any individual to control through non-institutional means (self-enforcing agreements). It is consistent with the model, then, that the country exhibits considerable instability, since the institutional framework is insufficient to allow the incumbent to supplement his self-enforcing agreements. Opposition generals, on the other hand, may find it relatively easier, given the large size of the military, to make self-enforcing agreements with disaffected segments of the military, laying the groundwork for further revolts.[19] Thailand, however, also exhibits significant military participation in economic activity. Under these circumstances, although institutions do little to restrain arbitrary actions by government decision makers, it may be more likely that those decision makers have interests that are more closely aligned with those of entrepreneurs. Consequently, the instability of Thailand's governments would have more muted effects on its economic growth. The extent to which this is true, of course, is likely to depend on the extent to

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[19] From Ozler and Tabellini (1991) Table 2, the observed frequency of turnover from 1972-1981 was .5 per year. From UNDP (1991) Table 19, the number in the military was 256,220.

which other entrepreneurs are in competition with the military, or do business with military competitors.

Of course, the model also provides an explanation for the relative stability of the industrialized countries, which, in contrast to the nations of developing countries, possess strong institutions that limit arbitrary behavior by state officials, including their ability to renege on promises to supporters.[20] Incumbents, then, are considerably more credible, reducing the incentive of incumbents to resign and of opponents to revolt.

Clearly, these examples can be nothing more than illustrative. More rigorous conclusions require a systematic investigation of the presence of credibility-enhancing institutions, of the costs to opponents of organizing revolts, either peaceful and constitutional or violent and extra-constitutional, as well as more traditional variables that have been employed in the analysis of political instability, including economic growth and inequality.

A crucial observation regarding political instability is that it suppresses economic growth. The standard reason given for this is that unstable regimes cannot credibly ensure the continuity of economic policies. The consequence of a lack of stable policies is, of course, reduced investment, since entrepreneurs have no confidence in the continuity of economic policies.[21] The model in this paper shows that such policy instability may not be a by-product of political instability, but rather that both may be the consequence of institutional deficiencies that prevent government officials from making credible policy commitments, and that prevent them from making credible promises to

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[20] The parliamentary, multi-party system that characterizes Italy, and other countries where coalition governments prevail, present relatively few institutional barriers to government change, compared to two-party parliamentary systems (Great Britain) or presidential systems (the United States). Where the costs of imposing a regime change are lower, holding credibility constant, one would expect greater instability. Credibility need not be missing in such systems because successor regimes are likely to be restricted by the institutional framework from quickly reversing all of the decisions of predecessor governments.

[21] See Keefer (1991, 1992), for example.

potential supporters. Instability and economic growth, then, may be jointly affected by the institutional framework in which government decisions are made. In this case, the institutions are the appropriate unit of analysis for investigating the roots of either instability or economic growth.

APPENDIX

Proof of Proposition One:

The objective functions of the two leaders are the following:

Leader 1: $(1 - \rho)(g_1R_1 + \pi_1)$

Leader 2: $(\rho)(g_2R_2 + \pi_2)$

Each leader maximizes her objective function over g_1 and g_2, respectively, producing the following first order conditions:

Leader 1: $(1 - \rho) = -\rho_{l_1}(g_1R_1 + \pi_1)\frac{\delta l_1}{\delta D_1}$,

Leader 2: $\rho = \rho_{l_2}(g_2R_2 + \pi_2)\frac{\delta l_2}{\delta D_2}$

Differentiating Leader 1's first order condition with respect to k_1, the following lengthy expression results. For completeness, expressions containing the cross-derivatives that have been assumed to be zero are included.

$$\text{A.1)}\quad \frac{\delta g_1^*}{\delta k_1}\left\{2\rho_{l_1}\frac{\delta l_1}{\delta D_1}R_1 - \rho_{l_1l_1}\left[\frac{\delta l_1}{\delta D_1}\right]^2 R_1(g_1R_1 + \pi_1) - \rho_{l_1}\frac{\delta^2 l_1}{\delta D_1^2}R_1(g_1R_1 + \pi_1)\right\}$$

$$= \rho_{l_1}\frac{\delta l_1}{\delta k_1} - \rho_{l_2}\frac{\delta l_2}{\delta D_2}\frac{\delta g_2^*}{\delta k_1}R_2 - \rho_{l_1l_1}\frac{\delta l_1}{\delta k_1}\frac{\delta l_1}{\delta D_1}(g_1R_1 + \pi_1)$$

$$+ \rho_{l_1l_2}\frac{\delta l_2}{\delta D_2}\frac{\delta g_2^*}{\delta k_1}\frac{\delta l_1}{\delta D_1}R_2(g_1R_1 + \pi_1) - \rho_{l_1}(g_1R_1 + \pi_1)\frac{\delta^2 l_1}{\delta D_1 \delta k_1}.$$

The differentiation of Leader 2's first order condition produces the following:

$$\text{A.2)}\quad \frac{\delta g_2^*}{\delta k_1}\left\{-2\rho_{l_2}\frac{\delta l_2}{\delta D_2}R_2 + \rho_{l_2l_2}\left[\frac{\delta l_2}{\delta D_2}\right]^2 R_2(g_2R_2 + \pi_2) + \rho_{l_2}\frac{\delta^2 l_2}{\delta D_2^2}R_2(g_2R_2 + \pi_2)\right\}$$

$$= -\rho_{l_1}\frac{\delta l_1}{\delta k_1} + \rho_{l_1}\frac{\delta l_1}{\delta D_1}\frac{\delta g_1^*}{\delta k_1}R_1 + \rho_{l_2l_1}(g_2R_2 + \pi_2)\left(\frac{\delta l_1}{\delta k_1}\frac{\delta l_2}{\delta D_2} - \frac{\delta l_1}{\delta D_1}\frac{\delta g_1^*}{\delta k_1}\frac{\delta l_2}{\delta D_2}R_1\right).$$

These two equations allow solutions to be found for $\frac{\delta g_1^*}{\delta k_1}$ and $\frac{\delta g_2^*}{\delta k_1}$.

Set $\mathbf{B} = \left\{ -2\rho_{l_2} \frac{\delta l_2}{\delta D_2} R_2 + \rho_{l_2 l_2} \left[\frac{\delta l_2}{\delta D_2}\right]^2 R_2(g_2 R_2 + \pi_2) + \rho_{l_2} \frac{\delta^2 l_2}{\delta D_2^2} R_2 (g_2 R_2 + \pi_2) \right\}$. Using the information in Table One, **B** can be signed and found to be negative. In addition, set $\mathbf{C} = -\rho_{l_2} \frac{\delta l_2}{\delta D_2} R_2$. The expression **C** is the change in Leader 2's political support that occurs when Leader 2 changes the share of rents that she offers to supporters. **C** is also negative, given the signs of its terms in Table One. Moreover, inspection reveals that $\frac{\mathbf{C}}{\mathbf{B}}$ is less than one.

Removing the terms that contain the cross-derivatives that have been assumed to equal zero, and substituting the expression for $\frac{\delta g_2^*}{\delta k_1}$ into $\frac{\delta g_1^*}{\delta k_1}$, the following results:

A.3)

$$\frac{\delta g_1^*}{\delta k_1}\left(\underset{(-)}{2\rho_{l_1} \frac{\delta l_1}{\delta D_1} R_1} - \rho_{l_1 l_1} \left[\frac{\delta l_1}{\delta D_1}\right]^2 R_1(g_1 R_1 + \pi_1) - \rho_{l_1} \frac{\delta^2 l_1}{\delta D_1^2} R_1 (g_1 R_1 + \pi_1) - \frac{\mathbf{C}}{\mathbf{B}} \rho_{l_1} \frac{\delta l_1}{\delta D_1} R_1 \right)$$

$$= \left(\underset{(-)}{\rho_{l_1} \frac{\delta l_1}{\delta k_1}} - \rho_{l_1 l_1} \frac{\delta l_1}{\delta k_1} \frac{\delta l_1}{\delta D_1}(g_1 R_1 + \pi_1) - \frac{\mathbf{C}}{\mathbf{B}} \rho_{l_1} \frac{\delta l_1}{\delta k_1} \right) - \underset{(+)}{\frac{\delta^2 l_1}{\delta D_1 \, \delta k_1} \rho_{l_1}(g_1 R_1 + \pi_1)}.$$

Inspection of this equation reveals that the sign of $\frac{\delta g_1^*}{\delta k_1}$ depends on the relative magnitude of $\left| \frac{\delta^2 l_1}{\delta D_1 \, \delta k_1} \rho_{l_1}(g_1 R_1 + \pi_1) \right|$ and $\left| \rho_{l_1} \frac{\delta l_1}{\delta k_1} - \rho_{l_1 l_1} \frac{\delta l_1}{\delta k_1} \frac{\delta l_1}{\delta D_1}(g_1 R_1 + \pi_1) - \frac{\mathbf{C}}{\mathbf{B}} \rho_{l_1} \frac{\delta l_1}{\delta k_1} \right|$. When the first of these is larger, the right hand side of the equation is positive, so $\frac{\delta g_1^*}{\delta k_1}$ must be

negative. When $\left|\rho_{l_1}\frac{\delta l_1}{\delta k_1} - \rho_{l_1 l_1}\frac{\delta l_1}{\delta k_1}\frac{\delta l_1}{\delta D_1}(g_1R_1 + \pi_1) - \frac{C}{B}\rho_{l_1}\frac{\delta l_1}{\delta k_1}\right| >$

$\left|\frac{\delta^2 l_1}{\delta D_1\,\delta k_1}\rho_{l_1}(g_1R_1 + \pi_1)\right|$, however, the right hand side of the equation is negative, so $\frac{\delta g_1^*}{\delta k_1}$ is positive.

The reaction of Leader 2 to a change in the credibility of Leader 1 can be found in a similar manner. Rewriting the first order condition for Leader 2, substituting the solution for $\frac{\delta g_1^*}{\delta k_1}$, and removing the terms that contain zero-valued derivatives, the following expression emerges:

A.4)

$$\underset{(-)}{\frac{\delta g_2^*}{\delta k_1}\left\{-2\rho_{l_2}\frac{\delta l_2}{\delta D_2}R_2 + \rho_{l_2 l_2}\left[\frac{\delta l_2}{\delta D_2}\right]^2 R_2(g_2R_2 + \pi_2) + \rho_{l_2}\frac{\delta^2 l_2}{\delta D_2^2}R_2(g_2R_2 + \pi_2)\right\}}$$

$$\underset{(?)}{=\frac{\delta g_1^*}{\delta k_1}\rho_{l_1}\frac{\delta l_1}{\delta D_1}R_1} \underset{(+)}{-\rho_{l_1}\frac{\delta l_1}{\delta k_1}}.$$

The sign of $\frac{\delta g_2^*}{\delta k_1}$ clearly depends on the sign of $\frac{\delta g_1^*}{\delta k_1}$ and on the relative magnitudes of the two terms on the right hand side, $\frac{\delta g_1^*}{\delta k_1}\rho_{l_1}\frac{\delta l_1}{\delta D_1}R_1$ and $\rho_{l_1}\frac{\delta l_1}{\delta k_1}$. This suggests three cases that summarize the results of this proposition.

Case 1: $\left|\frac{\delta^2 l_1}{\delta D_1\,\delta k_1}\rho_{l_1}(g_1R_1 + \pi_1)\right| > \left|\rho_{l_1}\frac{\delta l_1}{\delta k_1} - \rho_{l_1 l_1}\frac{\delta l_1}{\delta k_1}\frac{\delta l_1}{\delta D_1}(g_1R_1 + \pi_1) - \frac{C}{B}\rho_{l_1}\frac{\delta l_1}{\delta k_1}\right|$

Under this condition, $\frac{\delta g_1^*}{\delta k_1}$ is negative, so the right hand side of the solution for $\frac{\delta g_2^*}{\delta k_1}$ is always positive. Therefore, $\frac{\delta g_2^*}{\delta k_1}$ is negative.

Case 2: $\left|\frac{\delta^2 l_1}{\delta D_1\, \delta k_1}\rho_{l_1}(g_1R_1+\pi_1)\right| > \left|\rho_{l_1}\frac{\delta l_1}{\delta k_1} - \rho_{l_1 l_1}\frac{\delta l_1}{\delta k_1}\frac{\delta l_1}{\delta D_1}(g_1R_1+\pi_1) - \frac{C}{B}\rho_{l_1}\frac{\delta l_1}{\delta k_1}\right|$ and $\frac{\delta l_1}{\delta D_1}R_1 < \frac{\delta l_1}{\delta k_1}$

Because of the first assumption, $\frac{\delta g_1^*}{\delta k_1}$ is positive, making the sign of the right hand side of the expression for $\frac{\delta g_2^*}{\delta k_1}$ ambiguous. Given the assumption that $\frac{\delta l_1}{\delta D_1}R_1 < \frac{\delta l_1}{\delta k_1}$, however, it becomes clear by inspection that $\frac{\delta g_2^*}{\delta k_1} < 0$.

Case 3: $\left|\frac{\delta^2 l_1}{\delta D_1\, \delta k_1}\rho_{l_1}(g_1R_1+\pi_1)\right| > \left|\rho_{l_1}\frac{\delta l_1}{\delta k_1} - \rho_{l_1 l_1}\frac{\delta l_1}{\delta k_1}\frac{\delta l_1}{\delta D_1}(g_1R_1+\pi_1) - \frac{C}{B}\rho_{l_1}\frac{\delta l_1}{\delta k_1}\right|$ and $\frac{\delta l_1}{\delta D_1}R_1 > \frac{\delta l_1}{\delta k_1}$

The logic is the same as in Case 2. Here, however, $\frac{\delta l_1}{\delta D_1}R_1 > \frac{\delta l_1}{\delta k_1}$, so the right hand side is negative and $\frac{\delta g_2^*}{\delta k_1} > 0$. Q.E.D.

Proof of Proposition Two

When k_1 changes, the probability of a successful revolt changes in the following way:

$$\frac{\delta\rho}{\delta k_1} = \rho_{l1}\left(-\frac{\delta l_1}{\delta D_1}\frac{\delta g_1^*}{\delta k_1}R_1 + \frac{\delta l_1}{\delta k_1}\right) - \rho_{l2}\left(\frac{\delta l_2}{\delta D_2}\frac{\delta g_2^*}{\delta k_1}R_2\right).$$

These terms can be signed for each of the three cases in Proposition One.

Case 1 : $\frac{\delta g_1^*}{\delta k_1} < 0$ and $\frac{\delta g_2^*}{\delta k_1} < 0$

By inspection, the second term on the right hand side is positive and the first term on the right hand side is negative. However, it is easy to see that the absolute value of the second term is always less than the absolute value of the first term, so that the right hand side is less than zero, and $\frac{\delta\rho}{\delta k_1} < 0$.

Recall from the proof for Proposition One that the solution for $\frac{\delta g_2^*}{\delta k_1}$ is given by

$$\frac{\delta g_2^*}{\delta k_1}\left\{-2\rho_{l2}\frac{\delta l_2}{\delta D_2}R_2 + \rho_{l2l2}\left(\frac{\delta l_2}{\delta D_2}\right)^2 R_2(g_2R_2 + \pi_2) + \rho_{l2}\frac{\delta^2 l_2}{\delta D_2^2}R_2(g_2R_2 + \pi_2)\right\}.$$

(+)

$= \frac{\delta g_1^*}{\delta k_1}\rho_{l1}\frac{\delta l_1}{\delta D_1}R_1 - \rho_{l1}\frac{\delta l_1}{\delta k_1}$. Multiply the right hand side of this equation by -1 and rewrite it as $\rho_{l1}\left(-\frac{\delta l_1}{\delta D_1}\frac{\delta g_1^*}{\delta k_1}R_1 + \frac{\delta l_1}{\delta k_1}\right)$, and set it equal to **Q**. However, **Q** is simply the first term on the right hand side of the equation for $\frac{\delta\rho}{\delta k_1}$. Rewrite the second term on the right hand side of the equation for $\frac{\delta\rho}{\delta k_1}$, substituting the solution for $\frac{\delta g_2^*}{\delta k_1}$ and **Q** into the term to get:

$$-Q\left(\frac{-\rho_{l_2}\frac{\delta l_2}{\delta D_2}R_2}{-2\rho_{l_2}\frac{\delta l_2}{\delta D_2}R_2+\rho_{l_2 l_2}\left(\frac{\delta l_2}{\delta D_2}\right)^2 R_2(g_2R_2+\pi_2)+\rho_{l_2}\frac{\delta^2 l_2}{\delta D_2^2}R_2(g_2R_2+\pi_2)}\right)$$. Since all terms in the denominator are negative, it is easy to see, by inspection, that the ratio in brackets is positive and less than 1. Therefore, the second term on the right hand side of $\frac{\delta\rho}{\delta k_1}$ is always of lower absolute value than the first term.

Case 2: $\frac{\delta g_1^*}{\delta k_1}>0$ and $\frac{\delta g_2^*}{\delta k_1}<0$

Rewriting the expression for clarity,

$\frac{\delta\rho}{\delta k_1}=\rho_{l_1}\left(-\frac{\delta l_1}{\delta D_1}\frac{\delta g_1^*}{\delta k_1}R_1+\frac{\delta l_1}{\delta k_1}\right)-\rho_{l_2}\left(\frac{\delta l_2}{\delta D_2}\frac{\delta g_2^*}{\delta k_1}R_2\right)$. The second term on the right hand side is unambiguously positive in this case. To sign $\rho_{l_1}\left(-\frac{\delta l_1}{\delta D_1}\frac{\delta g_1^*}{\delta k_1}R_1+\frac{\delta l_1}{\delta k_1}\right)$, substitute $\frac{\delta g_1^*}{\delta k_1}$ in the solution for $\frac{\delta g_1^*}{\delta k_1}$, and rewrite the expression as

$$\rho_{l_1}\left(\frac{-\frac{\delta l_1}{\delta D_1}R_1\{\frac{\delta l_1}{\delta k_1}[\rho_{l_1}-\rho_{l_1 l_1}\frac{\delta l_1}{\delta D_1}(g_1R_1+\pi_1)-\frac{\mathbf{C}}{\mathbf{B}}\rho_{l_1}]-\frac{\delta^2 l_1}{\delta D_1\,\delta k_1}\rho_{l_1}(g_1R_1+\pi_1)\}}{\frac{\delta l_1}{\delta D_1}R_1\left[2\rho_{l_1}-\rho_{l_1 l_1}\frac{\delta l_1}{\delta D_1}(g_1R_1+\pi_1)-\frac{\mathbf{C}}{\mathbf{B}}\rho_{l_1}\right]-\rho_{l_1}\frac{\delta^2 l_1}{\delta D_1^2}R_1(g_1R_1+\pi_1)}+\frac{\delta l_1}{\delta k_1}\right)$$

Set the denominator equal to **D** and rewrite as:

$$\rho_{l_1}\left[\frac{\frac{\delta l_1}{\delta k_1}\left[-\frac{\delta l_1}{\delta D_1}R_1[\rho_{l_1}-\rho_{l_1 l_1}\frac{\delta l_1}{\delta D_1}(g_1R_1+\pi_1)-\frac{C}{B}\rho_{l_1}]\right]}{\frac{\delta l_1}{\delta D_1}R_1(2\rho_{l_1}-\rho_{l_1 l_1}\frac{\delta l_1}{\delta D_1}(g_1R_1+\pi_1)-\frac{C}{B}\rho_{l_1})-\rho_{l_1}\frac{\delta^2 l_1}{\delta D_1^2}R_1(g_1R_1+\pi_1)}\right]$$

$$+\rho_{l_1}\left[\frac{\frac{\delta^2 l_1}{\delta D_1\,\delta k_1}\rho_{l_1}(g_1R_1+\pi_1)\frac{\delta l_1}{\delta D_1}R_1}{D}+\frac{\delta l_1}{\delta k_1}\right]$$

From Proposition One and the assumptions on derivative signs, the term in the first set of brackets is negative; the first term in the second set is positive and the second term in the second set of brackets is positive. This last term can be shown to be greater in absolute value than the first term in the first set of brackets, however, so that the whole expression is negative. In the first term, $\frac{\delta l_1}{\delta k_1}$ is multiplied by a ratio, the absolute value of which is less than one, by inspection. Then the magnitude of the second term in the second bracketed expression is greater than that of the first term, and the sum of the two is positive. As a result, since $\rho_{l_1} < 0$, the whole expression is negative.

Case 3: $\frac{\delta g_1^*}{\delta k_1} > 0$ and $\frac{\delta g_2^*}{\delta k_1} > 0$

Once again, $\frac{\delta \rho}{\delta k_1} = \rho_{l_1}\left[-\frac{\delta l_1}{\delta D_1}\frac{\delta g_1^*}{\delta k_1}R_1+\frac{\delta l_1}{\delta k_1}\right] - \rho_{l_2}\left[\frac{\delta l_2}{\delta D_2}\frac{\delta g_2^*}{\delta k_1}R_2\right]$. The second term on the right hand side is unambiguously negative. The first term on the right hand side, by the arguments from Case 3, is unambiguously negative, as well. In this third case, as in the others, an increase in the credibility of the incumbent has an unambiguously negative impact on the probability that a revolt will be successful.

Q.E.D.

Proof of Proposition Three

Political instability increases whenever either the incentives of the incumbent to resign or the incentives of the opposition to revolt increase. From the discussion above,

under the assumption that mixed strategies are not employed, Leader 1 remains in power whenever $(1 - \rho)(g_1^* R_1 + \pi_1) > \pi_1$. Leader 2 chooses not to revolt whenever $(\rho)(g_2^* R_2 + \pi_2) > \pi_2$. As the left hand terms rise, therefore, instability declines. It remains only to show how the left hand terms change, in each of the three cases, when k_1 (credibility) rises. Deriving the left hand side of Leader 1's expression with respect to k_1, the following results: $-\frac{\delta\rho}{\delta k_1}(g_1^* R_1 + \pi_1) + (1 - \rho)\frac{\delta g_1^*}{\delta k_1} R_1$. Set this equal to **M**. Deriving the right hand side of Leader 2's expression with respect to k_1, the following results: $\frac{\delta\rho}{\delta k_1}(g_2^* R_2 + \pi_2) + \rho\frac{\delta g_2^*}{\delta k_1} R_2$. Set this expression equal to **N**.

Case One: The sign of **M** is ambiguous and $\mathbf{N} < 0$.

By Proposition One, $\frac{\delta g_1^*}{\delta k_1} < 0$, so the second term of **M** is negative. By Proposition Two, $\frac{\delta\rho}{\delta k_1} < 0$, so the first term is positive. Consequently, the sign of **M** is ambiguous. That is, when the incumbent's credibility increases, the expected rewards to remaining in office may actually decline. This can only occur, however, if the decreased rent share that the incumbent retains (given by $(1 - \rho)\frac{\delta g_1^*}{\delta k_1} R_1$) is not offset by the increased probability of receiving those rents, because of the decline in the probability of a successful revolt (which is given by $-\frac{\delta\rho}{\delta k_1}(g_1^* R_1 + \pi_1)$).

However, the expected returns of Leader 2 to rebelling unambiguously decline ($\mathbf{N} < 0$), so that an increase in credibility under Case 1 unambiguously reduces the likelihood that Leader 2 will revolt. By Proposition One, $\frac{\delta g_2^*}{\delta k_1} < 0$, so $\rho\frac{\delta g_2^*}{\delta k_1} R_2$ is

negative. By Proposition Two, $\frac{\delta\rho}{\delta k_1} < 0$, so $\frac{\delta\rho}{\delta k_1}(g_2^* R_2 + \pi_2)$ is also negative.

Consequently, under the conditions of Case One, an increase in the credibility of the incumbent reduces both the probability that a revolt will be successful, and the rents that Leader 2 could retain from a revolt.

Case 2: $\mathbf{M} > 0$, $\mathbf{N} < 0$.

By Proposition One, $\frac{\delta g_1^*}{\delta k_1} > 0$, so the second term of **M** is positive. By Proposition Two, $\frac{\delta\rho}{\delta k_1} < 0$, so the first term is also positive and $\mathbf{M} > 0$. An increase in the credibility of the incumbent increases the likelihood that Leader 1 will choose to remain in office.

By the arguments given above for Case 1, $\mathbf{N} < 0$, so an increase in incumbent credibility reduces the likelihood that Leader 2 will revolt.

Case 3: $\mathbf{M} > 0$, the sign of **N** is ambiguous.

Using the same arguments in Case 2, **M** is positive. Consequently, the incumbent leader is more likely to remain in office when her credibility increases. However, the results for Leader 2's expected income (the sign of **N**) if she revolts are ambiguous. By Proposition One, $\frac{\delta g_2^*}{\delta k_1} > 0$, so $\rho \frac{\delta g_2^*}{\delta k_1} R_2$ is positive. However, by Proposition Two, $\frac{\delta\rho}{\delta k_1} < 0$, so $\frac{\delta\rho}{\delta k_1}(g_2^* R_2 + \pi_2)$ is negative and the sign of **N** is ambiguous. That is, although the probability of a successful revolt declines, Leader 2 plans to retain a greater share of rents. This greater share may offset the reduced probability of success, and lead her to be more inclined to revolt. Q.E.D.

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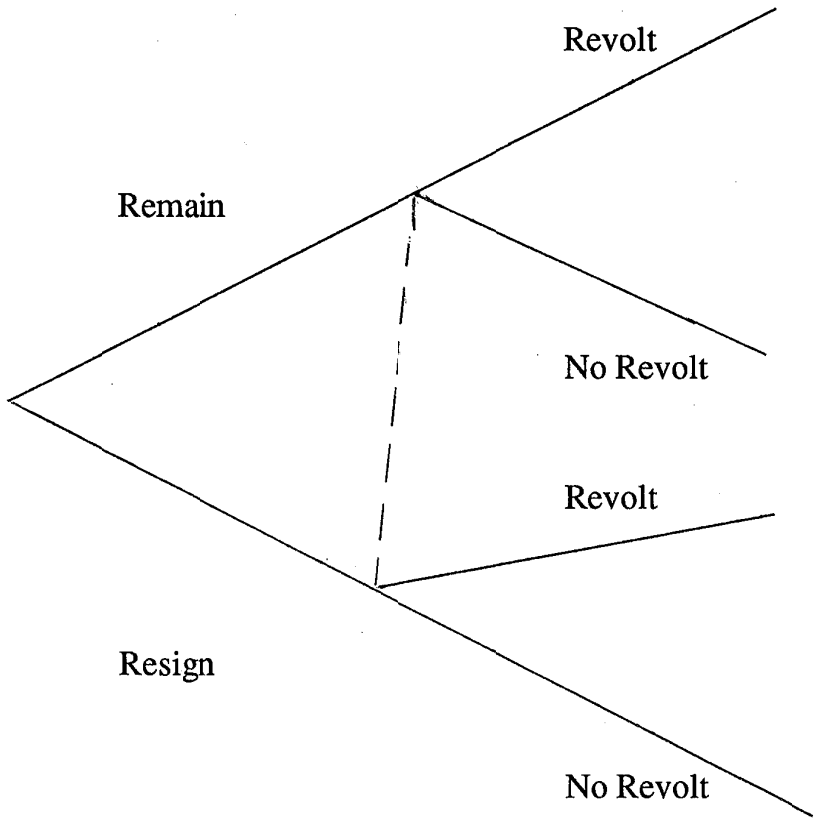
Figure One



	Leader One	Leader Two
Revolt	$(1 - \rho)(g_1R_1 + \pi_1)$	$(\rho)(g_2R_2 + \pi_2)$
No Revolt	$(g_1R_1 + \pi_1)$	π_2
Revolt	π_1	$(g_2R_2 + \pi_2)$
No Revolt	π_1	$(g_2R_2 + \pi_2)$